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It is held generally, in popular misconceptions of the doctrine of evolution, that man is a direct descendant of the higher apes, and the gorilla is commonly looked on as being his nearest progenitor. From the standpoint of science, however, no student of biology will maintain that the ancestry of man has yet been fully traced, but will limit himself to the conviction that at some period of the prehistoric world, the forces of nature, acting from without, on the plastic materials of life, have brought down from an unknown point of departure—perhaps among the lemurs—two diverging lines of development, one of which finds its present type in man, the other in the Catarrhine monkeys and their highest form—the anthropoids.

Perhaps the future of science may unfold the details of development, but to do this it is probable that ages of geological upheaval will be required, to bring above the ocean continents long buried, in which the process took place and in which the records are contained.

Manlike as are the apes, there is a contrast which the resemblance serves, in great part, but to intensify—anatomy finds similarity throughout and takes note of little that is unlike, while function, based upon these structures, has become so specialized and elevated during progress from the lower to the higher, as to become almost difference, and man and ape are in fact as in time separated by a gulf so vast that the furthest reach of science can catch, as yet, but shadowy outlines of the other side.

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## INDIAN STONE GRAVES.<sup>1</sup>

BY CHARLES RAU.

THERE seems to be a rather general impression that the so-called stone graves, so frequent in some States of the Mississippi valley, belong to a remote period—at least to a time long anteceding the arrival of the whites in North America. No doubt many of these graves are very old, as is shown by the appearance of the bones they contain; but to others a more or less recent date must be ascribed, and there is even evidence that the practice of constructing them had not yet ceased in the present century. I purpose to furnish that evidence in this paper.—

<sup>1</sup>Read at the Montreal Meeting of the American Association for the Advancement of Science, August 25, 1882.

A very good account of an exploration of stone graves in the neighborhood of Prairie du Rocher, in Randolph county, Illinois, was given, many years ago, by Dr. A. Wislizenus, of St. Louis.<sup>1</sup> He examined eleven of these graves, which he describes in proper succession, closing with a résumé of his investigation. "The general construction of these graves," he says, "is coffin-like, their side-walls, top and bottom, being formed by flat limestones, joined together without cement. The size of the graves was adapted to that of the persons to be buried in them. We find them, therefore, in length, from  $1\frac{1}{2}$  to 7 feet; in width, from 1 to  $1\frac{1}{2}$  feet; and, in depth, from 1 to  $1\frac{1}{2}$  feet. The top-layer of stones is seldom deeper than half a foot below the ground." The graves are always close together, but there is no apparent order in their position or direction. He counted from twenty to a hundred graves in different burying-grounds, which are always situated on some elevation, slight as it may be. The bluff-formation of that region facilitated the selection of proper sites. In graves which had not been disturbed he found the skeletons stretched out at their natural length and lying on the back. The artefacts accompanying the human remains were pointed flints, stone tomahawks, bone implements, marine shells (*Pyrula*, *Marginella*), fluviatile shells, and pottery, which, he thinks, "shows more expertness in that art than the present Indians possess." No metallic object was met with by Dr. Wislizenus.

He obtained but four well-preserved skulls, which he presented to the late Dr. Samuel George Morton, of Philadelphia, for his craniological collection. "All of them," he says, "bear the unmistakable signs of the American race, to wit: the broad massive lower jaw, high cheek-bones, salient nose, full superciliary ridge, low forehead, prominent vertex, and flattened occiput."

Dr. Morton, it is well known, divides the American race into two families, according to cranial formation, namely, the *Toltecan*, comprising the formerly half-civilized peoples of America, such as the Mexicans, Central Americans, Peruvians, Muyscas of Bogotá, and others, and the much more numerous *American*, including all barbarous tribes of the new world, excepting the inhabitants of the polar regions, to whom he ascribes a Mongo-

<sup>1</sup> Wislizenus: Indian Stone Graves in Illinois, in: Transactions of the Academy of Science of St. Louis, Vol. I (1857), p. 66, etc.—The exploration had taken place in 1843.

lian origin. The mound-builders' skulls which he had occasion to examine are referred by him to the Toltec family.

Following this classification, Dr. Wislizenus discovered in two of the skulls exhumed by him the characteristics which Dr. Morton attributes to the American family, while the others exhibit what he regards as the Toltec conformation.<sup>1</sup> These four skulls were found in graves of the same construction, and hence Dr. Wislizenus infers "that persons of both families of the American race have lived, and were buried here, together." He then expresses his belief in the former occupancy of Florida and the Mississippi valley by Toltecs, either before or after their dispersion from Mexico, and, having made some observations on the causes which favored the long preservation of the skeletons, he continues: "Some are of the opinion that modern Indians, as, for instance, the Kaskaskias, are the authors of these graves; but no modern Indians, within my knowledge, bury their dead bodies in this manner; and even the oldest inhabitants of that part of Illinois, who have lived there both with the Indian and the buffalo, do not recollect any such custom among these Indians in burying their dead. It seems, therefore, more rational to suppose that these graves were built and used by an Indian race which disappeared before the intrusion of the white man."

It is quite natural that Dr. Wislizenus should have arrived at such a conclusion, no recent case of a stone-grave burial being known to him; and the circumstance that he had discovered no objects of the white man's handicraft in the graves examined by him, went far to strengthen him in his convictions. Yet he states, at the beginning of his article, that many of the graves "had already, out of mere curiosity, been opened, and their valuable contents been carried off or destroyed, without throwing any light upon their mysterious origin." This fully agrees with my own experience. I have seen quite a number of stone graves, but the majority of them, if I remember correctly, had been opened and deprived of their contents, no one knowing what they were. The discovery of an iron tomahawk, of glass beads, or of other objects not manufactured by Indians, would prove that the practice of interring in stone graves had not become

<sup>1</sup> Though Dr. Morton's great merits are generally acknowledged, his conclusions regarding American cranial formation no longer find strict adherence among later investigators.

obsolete after the contact with the whites. Yet, supposing such articles had been exhumed by ignorant relic-hunters, their significance would not have been appreciated by them, and the very fact of their existence would soon have been forgotten.

I have seen many stone graves in Illinois and Missouri, and have opened a few of them. A short account of my rather limited experience in this kind of exploration was communicated to Colonel Charles C. Jones, who published it in his well-known work on the antiquities of the Southern Indians.<sup>1</sup> I therefore will not repeat in this place what is already in print; but I will draw special attention to a fact, which, though isolated, is of some importance in its bearing upon the question of the continuance of stone-grave burial in recent times.

In 1861, while engaged in the investigations referred to, I visited the farm of Dr. Hammond Shoemaker, situated near Columbia, in Monroe county, Illinois. After some conversation, the Doctor invited me to follow him to one of his maize-fields, and there he showed me an empty stone grave, until lately the last resting-place of a Kickapoo Indian, who, the Doctor informed me, had been murdered many years ago, by one of his own tribe. The incident and the victim's interment by his people were then (1861) still in the recollection of old farmers of the county. As for the grave, I can assert that it differed in no way from others seen by me in the neighborhood. Several years before my visit, the Doctor had opened it and taken out the well-preserved skeleton, being in need of a skull for instructing a young man then studying the medical art under his guidance. Dr. Shoemaker was afterward induced to remove the skull, his wife not liking the aspect of that grim object, and, in order to put it altogether out of sight, he buried it in a piece of ground near his farmhouse. I was very desirous of obtaining the skull, and the Doctor kindly expressed his willingness to part with it, provided it could be found. He took a spade and we went in search of the skull. But unfortunately the area was covered with a dense growth of grass, and as the Doctor could not identify the spot where he had interred the skull, our efforts to recover it proved fruitless.

At that time Dr. Shoemaker was a white-haired, hale old gen-

<sup>1</sup> Jones (Charles C.): *Antiquities of the Southern Indians*, particularly of the Georgia Tribes. New York, 1873, p. 218, etc.

tleman, and in order to learn whether he still dwelled among the living, I addressed, a short time ago, a note of inquiry to the Hon. William R. Morrison, who represents in Congress the district to which Monroe county belongs. In his reply of June 24, 1882, he states as follows: "He still resides on his farm where you saw him, and has attained to the advanced age of eighty-two years. Strange as it may seem, he still has his little old wagon or gig with two wheels, in which he drives about, practising medicine in his neighborhood."

In the early part of this century the Kickapoos inhabited the country bordering on the central waters of the Illinois, and the head waters of the Kaskaskia and Embarras rivers in Illinois; but they roamed over the whole territory now forming that State, and far beyond it. The last of these audacious and enterprising Indians were removed in 1833 from Illinois to a reservation north of Fort Leavenworth, and they are still located in that neighborhood. A large number of Kickapoos had gone to Mexico, but many of them have returned to the United States.

I have not met with any account in which stone-grave burial proper is mentioned as being practised by modern Indians; yet something similar was observed by John D. Hunter, who lived many years among the Kickapoos, Kansas, Osages, and other Indians of the West. He says: "This ceremony [the burial] is performed differently, not only by different tribes, but by the individuals of the same tribe. The body is sometimes placed on the surface of the ground, between flat stones set edge upwards, and then covered over, first by similar stones, and then with earth brought a short distance; occasionally this stone casing is only applied to the head, and then again, it is altogether omitted. Others excavate the earth to the depth of two or three feet, and deposit their dead below its surface."<sup>1</sup>

It appears to me most probable that the stone graves owe their origin to the race inhabiting within historical times, or even earlier, the districts where they are found. The method of burial, very simple itself, was suggested by the facility of obtaining flag-stones suitable for the construction of these primitive coffins, which protected the dead most effectually from the attacks of wild beasts. If, finally, due consideration is given to the circum-

<sup>1</sup> Hunter: *Manners and Customs of several Indian Tribes located west of the Mississippi*. Philadelphia, 1823, p. 363.

stance that the articles found in the graves in question evince no higher skill than that attained by the more advanced of the historically known tribes of North American Indians, there hardly remains any reasonable ground for not ascribing to such tribes the humble mortuary receptacles treated in this hasty sketch.

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## ORGANIC PHYSICS.

BY CHARLES MORRIS.

(Continued from page 563, Vol. XVI.)

### 2. THE ORGANIC FUNCTION OF OXYGEN.

The subject here proposed is one to which considerable attention has been paid by inductive science, with the result of conclusively demonstrating that organic activity is strictly dependent upon the presence of oxygen, and that every animal, and each organ of every animal, displays an activity in close accordance with its supply of oxygen. This is about all that has been deduced from the facts observed, but is certainly not all that they indicate. Much wider deductions may be made; some, perhaps, only conjectural, yet others apparently unavoidable, and by their aid a fuller conception of the motor power of the animal kingdom may be gained. Such deductions must also include the vegetable kingdom, since it is now known that plants breathe oxygen as persistently as animals, and that they continue active only during their period of active oxygenation.

But to persistent vital activity nutrition is as essential as oxygenation. The one is the key that winds up the clock of life; the other is the spring that sets its wheels in motion, and frees its restrained energies. Oxygen eats into and breaks down the complex molecules of protoplasm. Nutrition rebuilds these molecules. Thus life forever swings, between limits of chemical analysis and synthesis. In the downward swing it bursts into full activity, and beats against the barriers of the outer world. In the upward swing it relapses into inactivity, and all its energies are employed in the chemical labor of forming new molecules of protoplasm.

These processes can hardly be simultaneous. The reduction of protoplasm by oxidation, and its reproduction in the opposite process cannot take place at once in the same cell.

Probably in every limited portion of tissue oxidation and repro-